10/501,148
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PCT/GB 2003 / 000194

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NP10 8QQ

REC'D 28 MAR 2003
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Signed

Dated 13 March 2003

tents Form 1/77

Act 1977
(Rule 16)

THE PATENT OFFICE
J
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NEWPORT

1/77
020CT02 E752535-1 C81053
P01/7700 0.00-0222776.7

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference
EAT PAT 6

2. Patent application number
(The Patent Office will fill in this part)
0222776.7

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*
E. A. TECHNICAL SERVICES Ltd
7-9 RYDAL PLACE
CLITHEROE ROAD
CLITHEROE
LANCASHIRE BB74JY

Patents ADP number *(if you know it)* 8306674001

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention
COMPRESSOR WITH VARIABLE PRESSURE AND FLOW CONTROL

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Patents ADP number *(if you know it)*

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*
0200991.8	17/01/02

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
   a) any applicant named in part 3 is not an inventor, or
   b) there is an inventor who is not named as an applicant, or
   c) any named applicant is a corporate body.
   See note (d))

YES

atents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	2
Claim(s)	0
Abstract	0
Drawing(s)	5

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature R W Driver Date 1 OCT 02

12. Name and daytime telephone number of person to contact in the United Kingdom RON DRIVER 01200 441492

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.*

b) *Write your answers in capital letters using black ink or you may type them.*

c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*

d) *If you have answered 'Yes' Patents Form 7/77 will need to be filed.*

e) *Once you have filled in the form you must remember to sign and date it.*

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Compressor with Variable Pressure and Flow Control

Over the past few years hybrid engines have been proposed that were a combination of electric motor and a relatively small engine running at near maximum power whenever it was used. More recently there has been a move to a higher voltage electrical system, this permits engines to stop when the vehicle stops and then for the vehicle to initially move off using the electric motor.

In the present invention it is proposed to use a combination of supercharger, internal combustion engine and exhaust turbine. The exhaust turbine may drive a compressor or electrical generator or both. The enabling technology to permit efficient use of this combination of components is the use of a supercharger of the type and incorporating a combination of compatible features described in application PCT/GB01/03089 and 0200991.8 and 0211603.6 and 0216084.4 and GB2364552 and the features described in the present invention. This type of supercharger allows the internal combustion engine's airflow to be controlled. It takes a full charge of air each revolution and evacuates air not required by pushing it out through the side disc metering orifice or orifices and allows the remainder to be discharged to the engine. In this manner the supercharger can supply air from ambient pressure to maximum supercharge pressure. This type of supercharger has compression efficiency comparable with the efficiency of the compression within an engine and an ability to accurately control airflow

The present invention provides a means of increasing the efficiency of the compressor in supercharger mode and the turbine in throttle loss recovery mode. It also extends the applicability of the machines described in PCT/GB01/03089 and 0200991.8 and 0211603.6 and 0216084.4 and GB2364552 to diesel engine charging and exhaust gas treatment.

Labyrinth seals are well known in the art and are known to reduce the flow of gasses and vapours when one part is in close proximity to another. In the present case the tip of the rotating piston is in close proximity to a mating surface. By forming a labyrinth seal in the piston and between the side discs and extending over an arcuate distance both on the leading and trailing side of the piston tip, the leakage of fluid between the piston and casing and for a time between the piston and the articulated vane is reduced. Leakage across the length of the periphery of the side discs will be reduced if a labyrinth seal is formed circumferentially in the disc peripheral surface. Labyrinth seals are most effective if the width of the groove and the groove depth are the same dimension and the fin between each groove is less than the groove width.

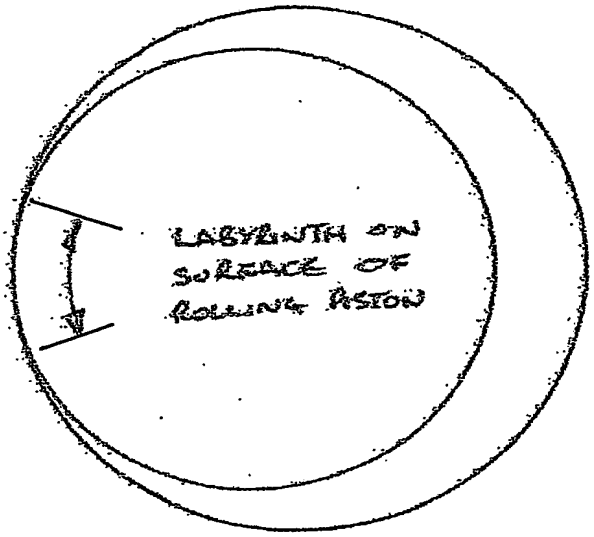
Modern diesel engines are perceived as producing too much nitrogen oxides and too much particulate matter that is passed into the atmosphere from their exhaust. The diesel engine is conventionally a compression ignition engine. The engine compression ratio is usually determined by the need to produce sufficient compression temperature to start the engine on a cold day. When the engine has reached running temperature the high compression needed for starting could be reduced and this would also reduce the pressure inside the cylinder. With a reduced cylinder pressure the fatigue life of the engine material would be increased, so the engine could be made lighter for the same fatigue life as at present.
By using a supercharger of the type described in PCT/GB01/03089 and 0200991.8 and 0211603.6 and 0216084.4 and GB2364552 variable boost pressure could be

supplied to the engine to provide cold start and normal running pressure desirable conditions. The ability of the superchargers described above to pass air out through the evacuation orifices or out through the outlet orifices to the engine manifold means either of these outlets could be used to supply air directly to the exhaust system for treatment of exhaust emissions. One possible exhaust gas treatment is to absorb nitric oxides and particulates and to burn them off sequentially, a supply of pressurised air for this purpose is most desirable.

The invention may be performed in various ways and some specific embodiments will now be described by way of example with reference to the accompanying diagrammatic drawings, in which:

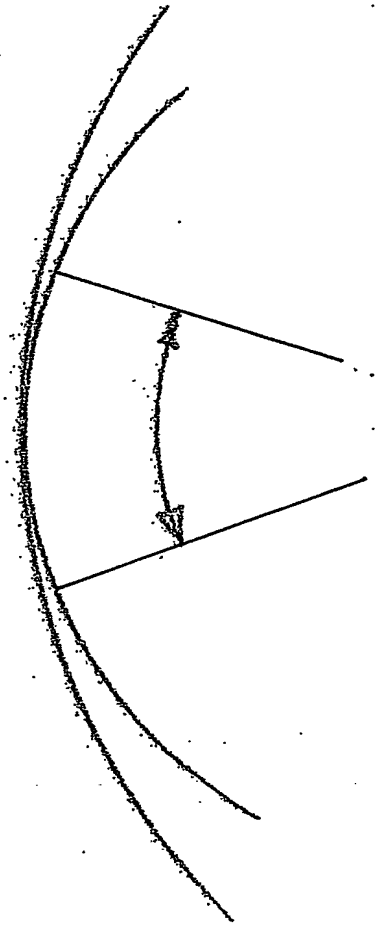
Fig 1 shows a cross section view of the rolling piston and labyrinth position
Fig 2 shows an enlarged view of Fig 1
Fig 3 shows an enlarged view of Fig 2 with details of the labyrinth.
Fig 4 shows a model of the rolling piston and the position of the labyrinth.
Fig 5 shows the evacuation orifices that could supply air to for exhaust treatment.
Fig 6 shows the outlet orifices that could supply air for exhaust treatment.

As the rolling piston rotates, air that is pushed out of the evacuation holes could be pushed into the exhaust system to supply oxygen for treatment of the exhaust gasses. If the air supply pressure requirement was low, say at a pressure of 20 kPa above atmosphere, the efficiency of pushing the air up to this exhaust system pressure would be reasonably high at about 80%, but because this type of compression is like a Roots compressor, with no internal compression, the efficiency would be about 40% if the pressure requirement was say, 100 kPa above atmosphere. Therefore for higher pressures it would be more efficient to supply the air from the manifold outlet side of the machine where, because there is internal compression to pressurise the air, the compression efficiency is near 90%.
Machine efficiency is improved by reducing leakage between high and low pressure regions by incorporation of a labyrinth to restrict the leakage flow.



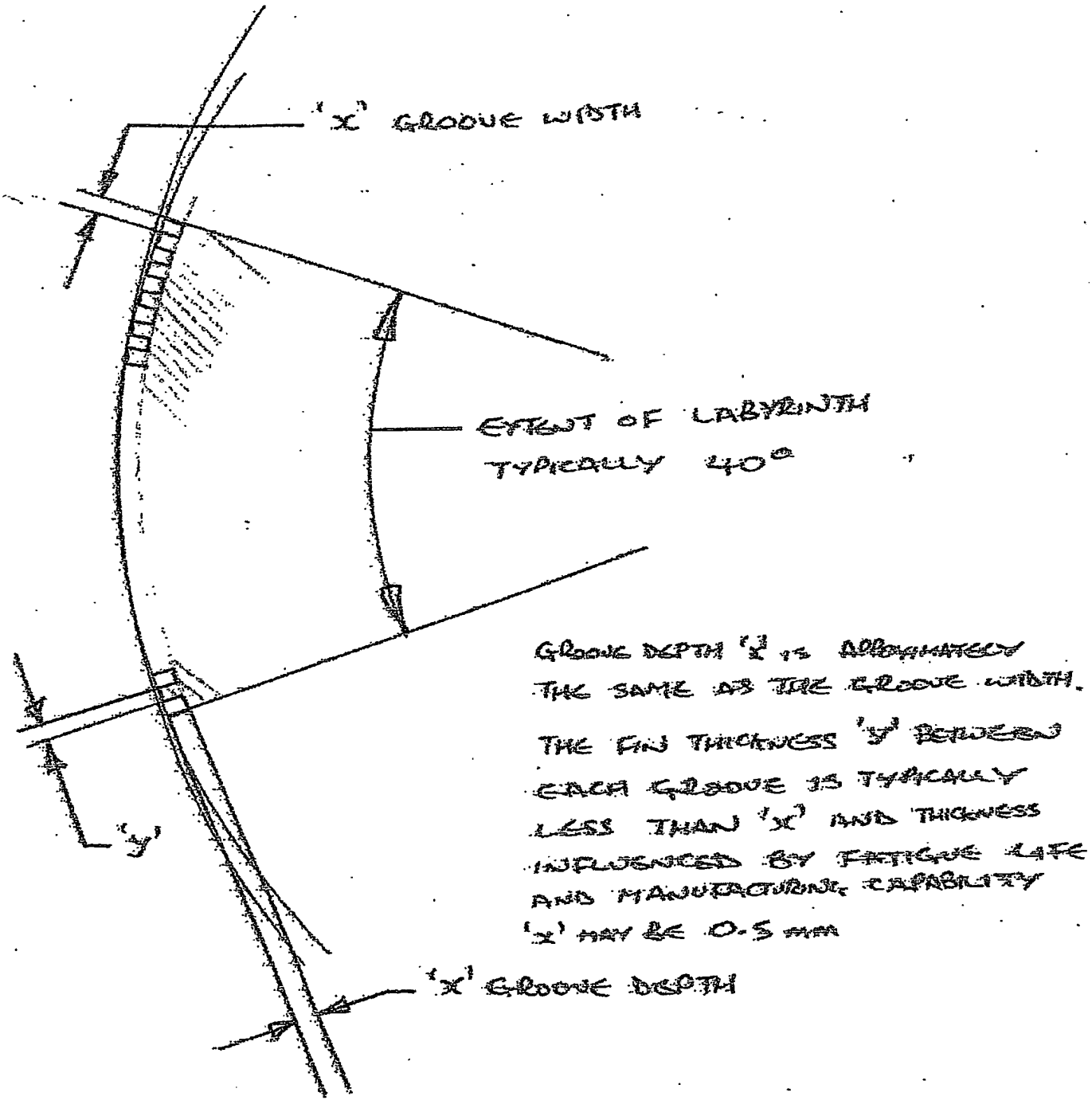
CROSS SECTION THROUGH
ROLLING PISTON

FIG 1



ENLARGED VIEW
AT FIG 1

FIG 2



ENLARGED VIEW OF FIG 2

FIG 3

Fig 4 Piston with labyrinth seal in part of the circumference

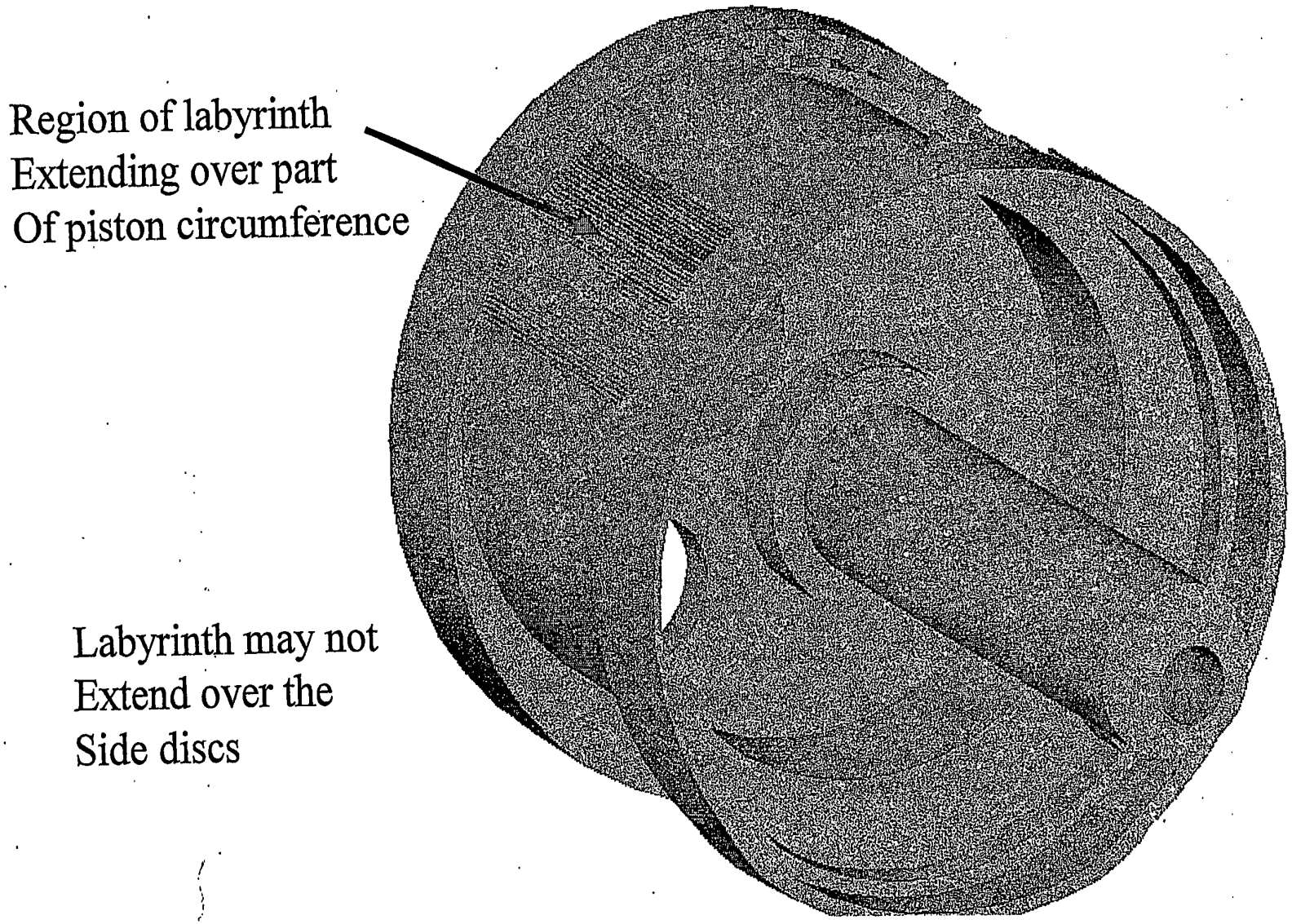


Fig 5 View on evacuation side of supercharger

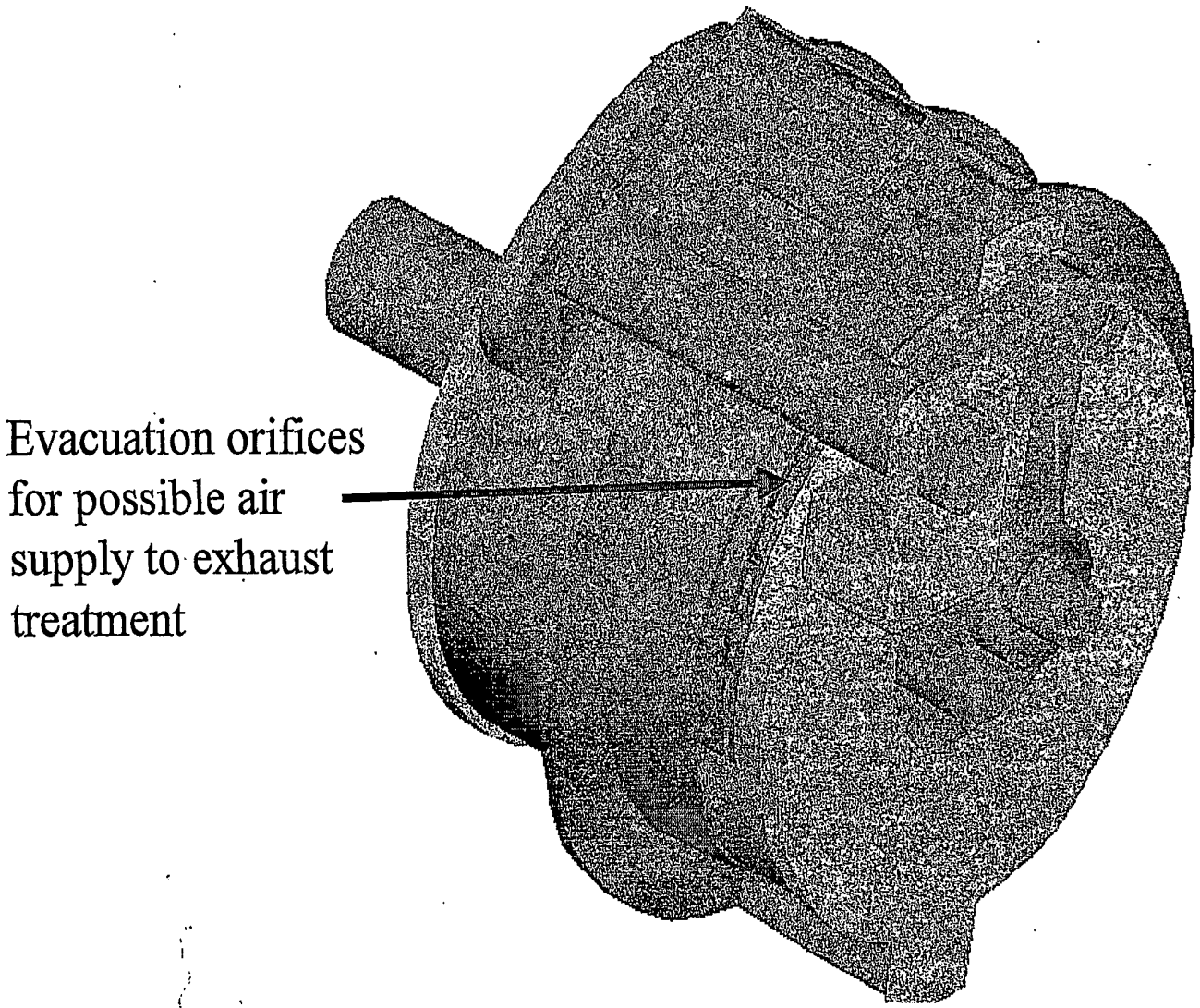


Fig 6 View on manifold outlet side of supercharger